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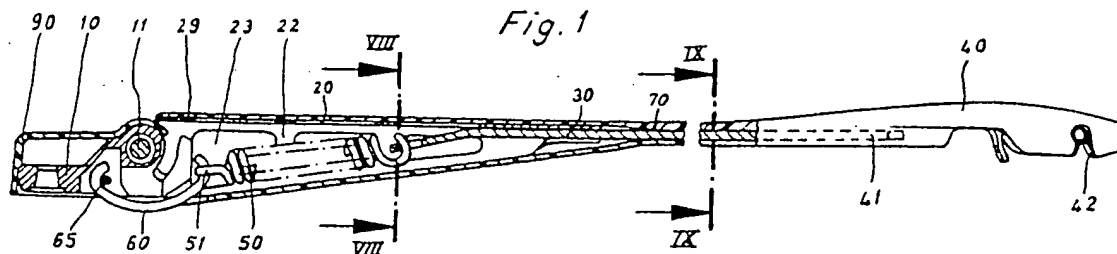
(58) Field of search

A4F

103 by itself
plastic
cover

(54) Wiper arm

(57) A wiper arm comprising a wiper rod 30 and channel-shaped link 20, each made of metallic material, is provided with a protective moulded plastics covering 70. The mounting socket 10 may also be provided with a moulded plastics cap 90. The covering 70 may be shaped to have a wind-deflecting part along its upper surface, or a bore within through which wash liquid may be supplied to a nozzle. The covering may be produced by injection moulding, casting, foam or dip moulding techniques, and may be in two parts which are releasably connectable to each other. The wiper arm may have a contact pressure spring assembly comprising yoke 60 and extension spring 50, or compression spring (130, Figs. 12, 13).



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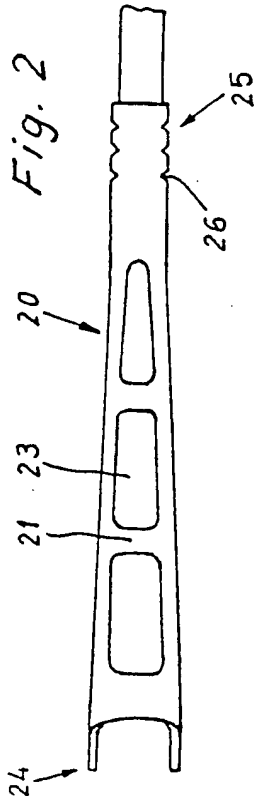
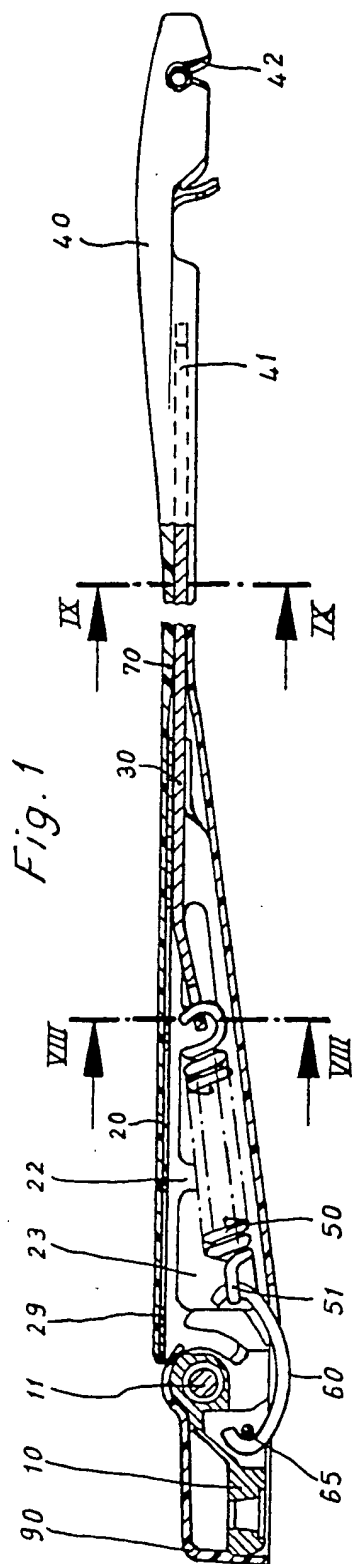
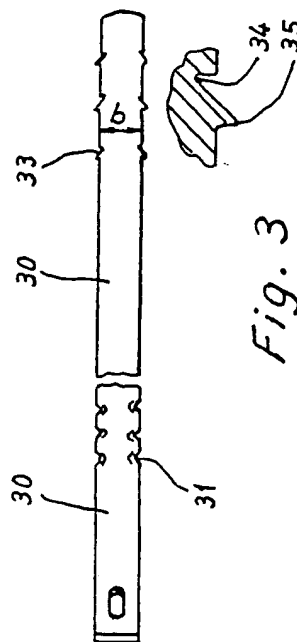


Fig. 4



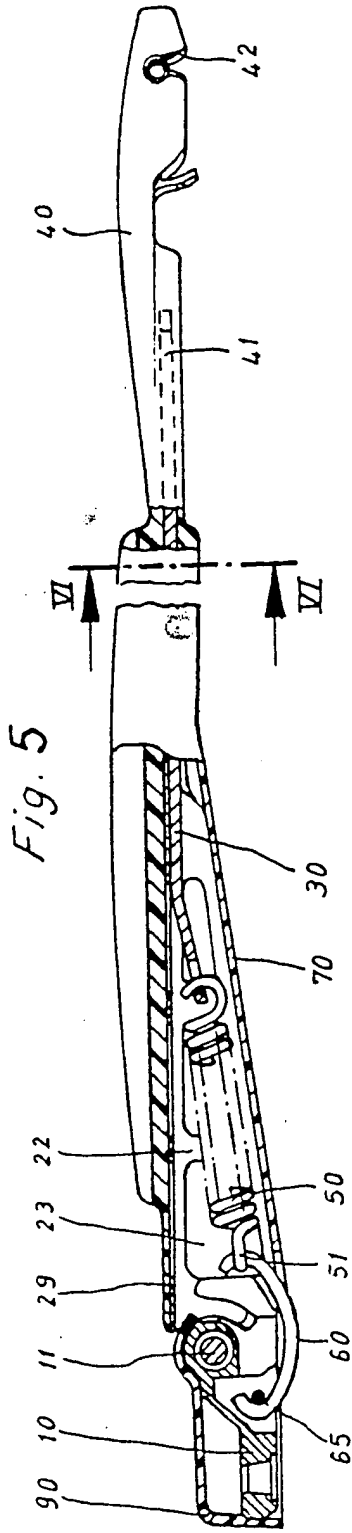


Fig. 5

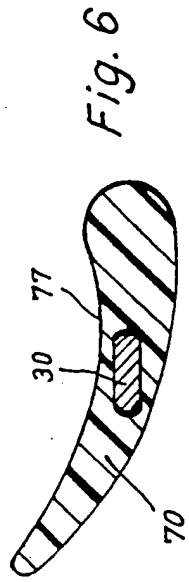


Fig. 6

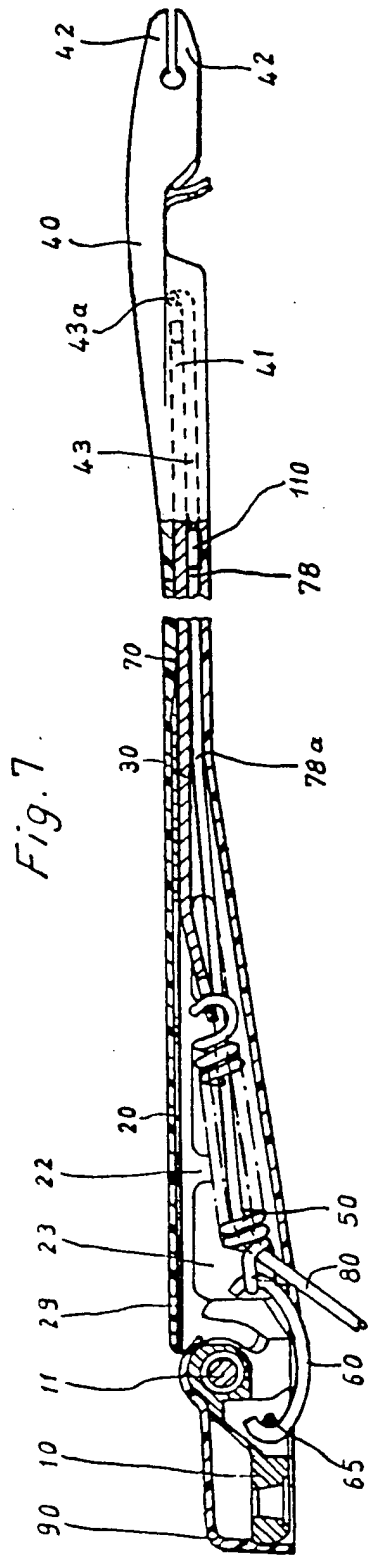
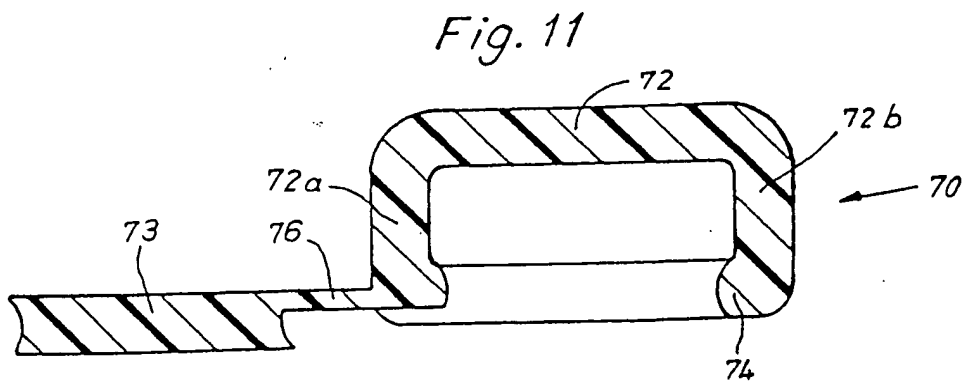
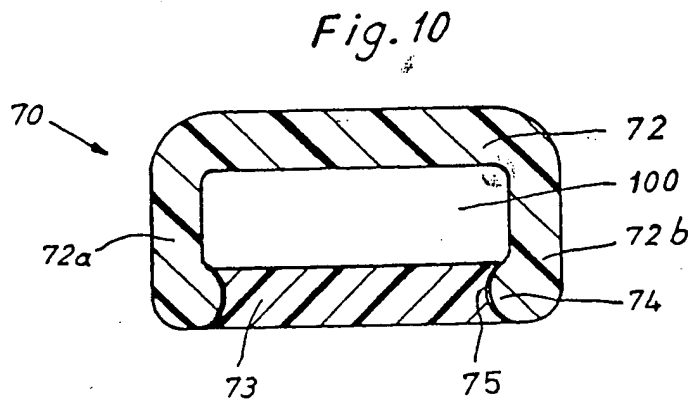
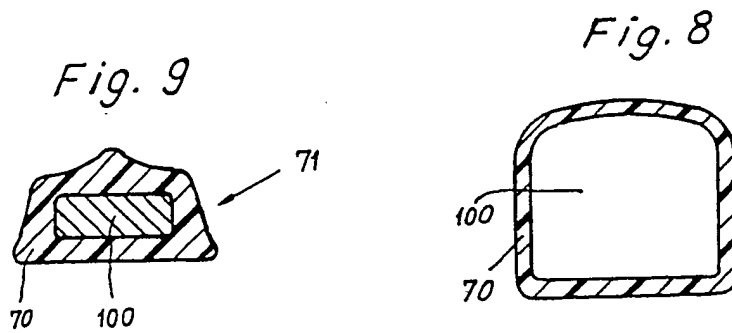


Fig. 7



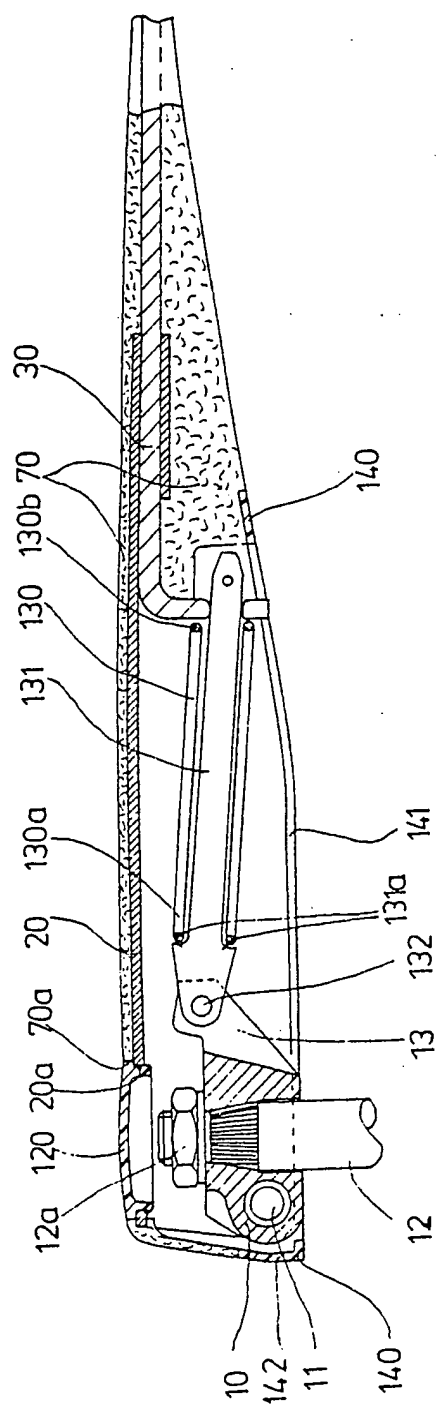
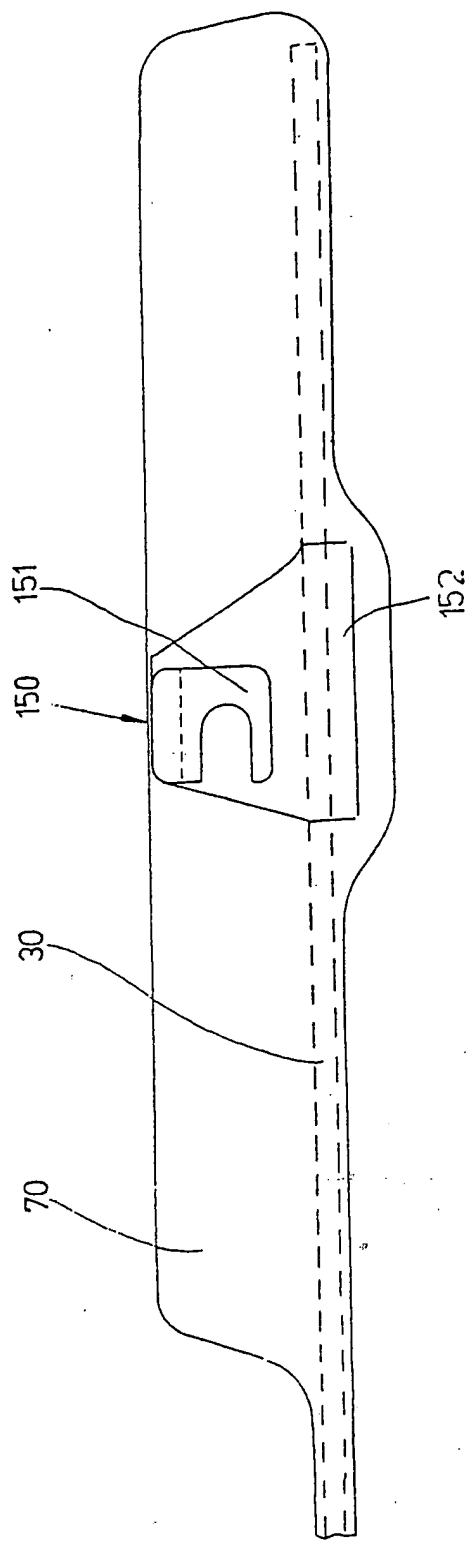
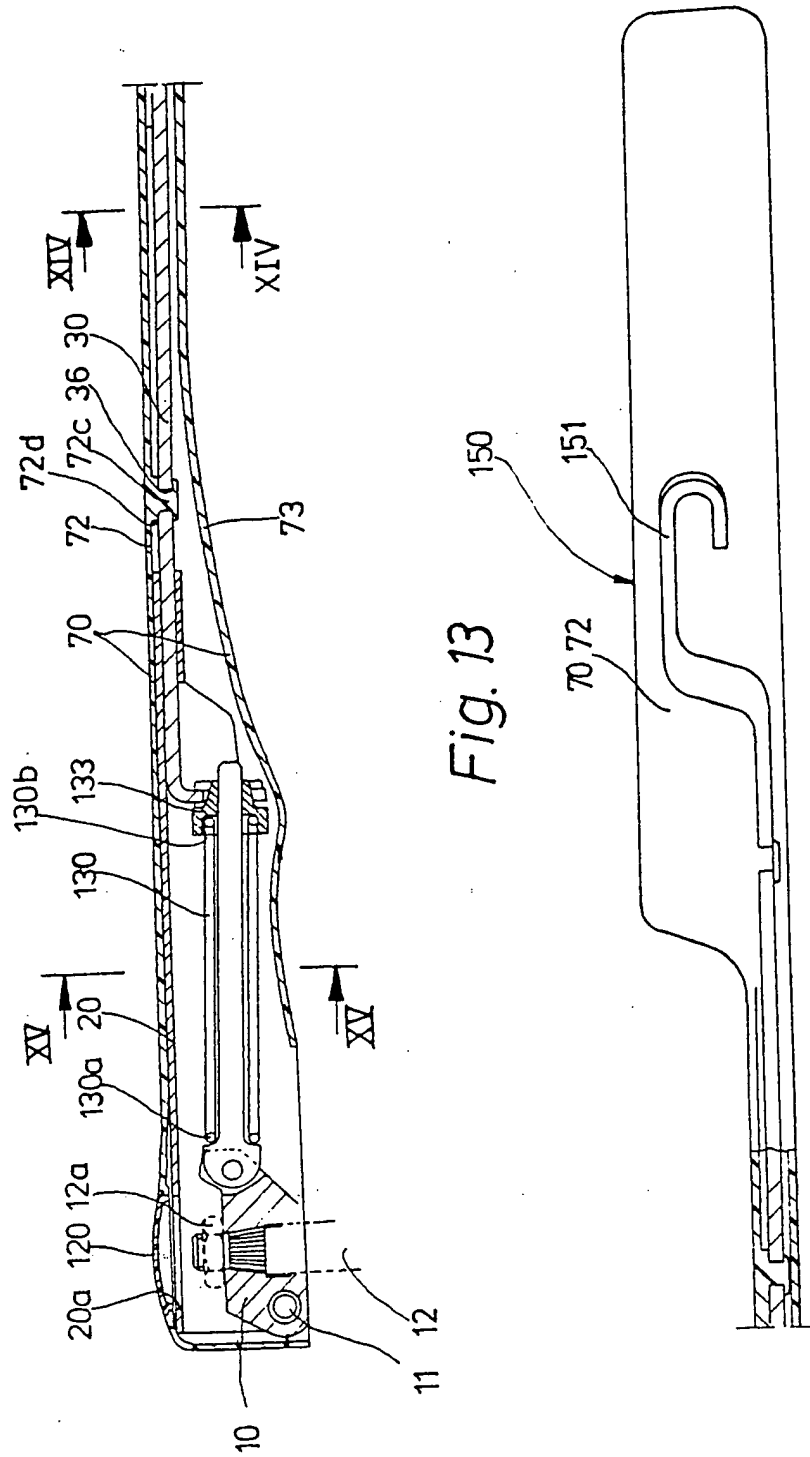


Fig. 12





4b.

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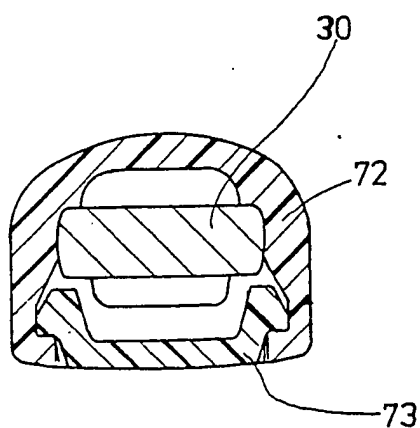


Fig. 14

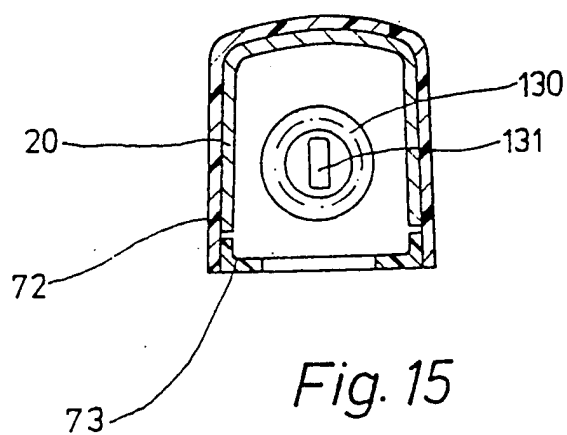


Fig. 15

SPECIFICATION

Wiper arm especially for wiper systems on motor vehicles

5 This invention relates to a wiper arm, especially for wiper systems on motor vehicles, comprising a link which is substantially formed in the manner of a channel having two
10 side walls and at least one connecting wall which firmly encompass a wiper rod on whose end not facing the link a wiper blade may be articulated via a connector and which link and which wiper rod are made from metallic materials and provided with a protective coating.
15 In known wiper arms of this kind the link and the wiper rod are usually made of steel sheet which is provided with a varnish coating after forming. On the one hand such a coating has a favourable effect on anticorrosion properties of the wiper arm and on the other hand admits to adapt the colour of link and wiper arm to the colour of the motor vehicle. However it is relatively difficult to make a
20 perfect coating. The wiper rod and the link of wiper arms are indeed often connected by rivets, although this type of connection includes a series of disadvantages. So, for instance, there is the risk of damaging the coating when making the necessary apertures for securing the rivet bodies and when carrying out the riveting. Then expensive refinishing operations are necessary in order not to deteriorate the anticorrosive properties and the
30 look of the wiper arm. Without refinishing operations the anticorrosive properties of the wiper arm would at most be ensured in cases in which parts of the wiper arm consist of stainless steel just as in the wiper arm according to the German specification AS 22 06 166. However the use of stainless steel makes the wiper arm much more expensive. Furthermore the wiper arm according to the German specification AS 22 06 166 also includes the disadvantage of the wiper arms known from
45 practice that the rivet heads protrude from the surface of the link. Bad-looking edges are visible also in this case because the wiper rod is encompassed by the walls of the link. Due to the fact that the link is open at its underside a spring element producing the contact pressure of the wiper arm is exposed to atmospheric influences and can sometimes also be seen from the vehicle interior.

55 It is therefore an object of this invention to improve a wiper arm of the initially mentioned type in such a way that it has a surface which is perfect in all respects. Nevertheless the wiper arm has to be manufactured simply and
60 at a reasonable price.

According to the present invention there is provided a wiper arm, especially for wiper systems on motor vehicles, comprising a link which is substantially formed in the manner of
65 a channel having two side walls and at least

one connecting wall which firmly encompass a wiper rod on whose end not facing the link a wiper blade may be articulated via a connector and which link and which wiper rod are made from metallic materials and provided with a protective coating, characterised in that the coating consists of a moulded plastics piece which on all sides and over almost its entire length encloses the structural unit consisting of the wiper rod and the link and elements accommodated in this link.

70 The principal difference of wiper arms constructed in this manner and those according to the prior art is that basic parts of the wiper arm can remain without surface treatment and/or consists of base metals, because the coating according to the invention is formed as an independent moulded piece which encloses the wiper arm everywhere. Thereby the limitation with regard to the longitudinal extension of the coating mentioned in the previous paragraph is only intended to ensure the applicability of the invention to wiper arms whose contact pressure is generated by a
80 spring element fastened between wiper arms and wiper shaft, so that they can be tilted from the window pane as usual, because in this case the coating does not hinder the evading motion of the spring element and the movement of the fastening member relative to the coating. Because the coating according to the invention is attached onto a structural unit and thus on parts which have already been mounted, there is no risk of damaging the parts during the assembly by drilling or
100 stamping tools and of having to refinish afterwards.

If the coating is at least as thick as the walls of the link the edges existing in the area of the junction point between wiper rod and link, which edges are formed by the front faces of the link, can be made invisible even if the coating abuts closely against the structural unit. If the coating is so thick and the mechanical properties of plastic are very good in general there is little danger of damaging the wiper arm surface even if the wiper arm according to the invention is in operation. Due to the variable thickness also other edges, joints and other irregularities of the structural unit can be made invisible, so that its outer generated surface seems to be smooth.

As plastic materials in particular those are taken into consideration which have spring properties, because these materials change their shape upon mechanical strain reversibly.

Because of their resiliency they can also closely abut against the structural unit self-sealing it.

125 As methods of manufacture for the moulded plastics piece injection-moulding, casting, foam or dip moulding are taken into account. As is known plastic materials in liquid or pasty condition hereby come into contact with the structural unit or with a complementary form

to the structural unit. Therefore the plastic material can optimally adapt to the given shape of the structural unit, so that in particular closely fitting coatings can also be made.

- 5 In order to manufacture the moulded plastics pieces with the suggested thickness by dip-moulding and in a manner consuming not too much time, only dippings with a sufficient viscosity may be used, so that the number of
10 dipping actions remains restricted to a minimum.

Furthermore it is advantageous that on the basis of the moulded plastics piece suggested the thickness of the coating can without difficulty be made so great that a passage to other structural units fastened on the wiper arm can be achieved without edges, such as to the wiper blade connecting member. If the thickness is even greater there is also a possibility to provide therein a channel for conducting a washing liquid supply line. Thereby one or more thicker or thinner areas of the moulded plastics piece can be provided for locking the moulded plastics piece with the wiper arm, by using them as a locking stud or locking indentation. Furthermore the wiper arm can be improved with respect to aerodynamics by thicker areas of the moulded plastics piece, in that these areas are designed with an aerodynamic profile. Thus a wiper arm can be improved in many ways by the moulded plastics piece without making its production much more expensive.

As far as separately injection-moulded or moulded plastics pieces are concerned, it is a great advantage, if they are made in two parts, because in this case the moulded plastics piece can be more easily mounted on the structural unit. A film-hinge prevents in a simple manner that the two parts can get lost.

If a receiver for the structural unit to be provided in the divided moulded plastics piece is arranged in that part or portion which after mounting of the wiper arm on the vehicle or during wiper operation is not facing the window pane to be cleaned, there are no inconvenient joints in the direction of wind flow, in which joints water, ice or dirt could accumulate.

50 If the two parts of the moulded plastics piece are detachably connectable with each other by matching elements the moulded plastics piece can be also offered as a retrofit kit and can even be used again after an exchange
55 of the wiper arm.

On the basis of the moulded plastics piece according to the invention costs of material can be considerably decreased. Over the greatest part of their length the walls of the link do not have a holding function and in conventional wiper arms are indeed only formed as a single piece on grounds of style. Due to the fact that the wiper arm according to the invention is surrounded by the moulded
60 plastics piece in the area of the link, the walls
65

can be made in an open-worked (network) manner, so that the costs of material and the weight of the wiper arm are decreased.

Costs of material can be furthermore reduced in that the wiper rod is provided with locking means for securing in a form-fit manner at least one of the piece parts to be connected with it, namely the link, the connecting member and/or the moulded plastics piece, because then no additional fastening means such as rivets or the like are needed any longer.

The amount of material and of piece parts can be further reduced, if the connecting member necessary for articulating the wiper blade is made as a single piece with the moulded plastics piece and/or combined with elements for washing liquid supply.

Thereby the moulded plastics piece can also be rearwards elongated beyond the link and cover a fastening member through which the link is connected in a torsionally firm way with a driven wiper shaft or may be so connected. In this case also this area of the wiper arm does not need a specific surface treatment and the otherwise customary cover for the fastening member can be omitted.

In order to provide that the moulded plastics piece in this case does not prevent or hinder the tilting of the link from the windshield or damage it when tilted by buckling it is suggested to articulate the link behind the wiper shaft on the fastening member.

If the moulded plastics piece thereby covers the fastening place of wiper arm and wiper shaft it is suggested to provide the moulded plastics piece with an aperture to be closed by a lockable cap. Then the fastening means, which normally is a screw or a nut, which holds the fastening member on the wiper shaft, is accessible if necessary without demounting the moulded plastics piece and without tilting the link.

It is furthermore suggested to elongate the moulded plastics piece beyond the connecting point of wiper arm and wiper blade so that it can cover the wiper blade over its entire length in the manner of a spoiler. In this case it is in particular an advantage when foam-moulded plastics pieces are used, if the wiper rod extends beyond the junction point with the wiper blade and as far as to the front end of the moulded plastics piece, because their stability against bending and buckling can thereby be considerably improved.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal section through a wiper arm according to one embodiment of the invention.

Figures 2, 3 and 4 are partial views of the wiper arm shown in Figure 1.

Figure 5 is a longitudinal section through another embodiment of wiper arm according

to the invention,

Figure 6 is a section taken on the line VI-VI of Figure 5.

Figure 7 is a longitudinal section through a third embodiment of wiper arm according to the invention,

Figures 8 to 11 are several examples of the moulded plastics piece in a cross-sectional view,

Figures 12 and 13 are longitudinal sections through fourth and fifth embodiments of wiper arm according to the invention and

Figures 14 and 15 are sections taken on the lines XIV-XIV and XV-XV of Figure 13.

Each wiper arm shown in Figures 1 to 7 has a fastening member 10 which is constructed in a manner known in itself and to which is articulated via a link rivet 11 in front of a wiper shaft 12, a channel-shaped link 20 having a substantially U-shaped cross-section and consisting of steel sheet, which link is shown in detail in Figure 2. The link 20 has a central wall 21 which connects two side walls 22. Both the central wall 21 and the side walls 22 are penetrated by apertures, so that the link 20 gives the impression of a lattice or network. With its side walls 22 it is secured on the rivet 11 at its first end 24, while it is tapered in the manner of a cone towards its second end 25 and encompasses in a formfit manner a wiper rod 30 of rectangular cross section with its side walls 22 and the central wall 21, which wiper rod has been shown in detail in Figure 3. Here several notches 31 are stamped into the longitudinal sides of the wiper rod 30, into which notches the link 20 engages by means of indentations 26 made in its side walls 22. By stamping the notches 31 in addition hump-shaped projections 32 come into existence in the wiper rod 30 which consists of a softer steel sheet than the link 20, which projections protrude from the surface of the wiper rod 30. The purpose of these projections 32 can be seen below from the description of Figures 1, 8 and 9.

Furthermore gear teeth 33 are stamped on the longitudinal sides of the end of the wiper rod far from the link 20, which gear teeth have in addition to notch-shaped indentations 34 also sharp-edged projections 35, on which a connecting member 40 of a resilient polyoxide is locked, which for this purpose has an inserting channel 41, whose width is slightly smaller than the width b of the wiper rod 30. Moreover the connecting member 40 is constructed in a manner known in itself and has several spring lugs 42, which can be pivoted on a wiper blade pin.

At the end of the wiper rod 30 positioned within the link 20 a spring element 50 is suspended which is realised by an extension spring which is secured on the fastening member 10 via a C-shaped auxiliary yoke 60 and a pin 10 and provides the necessary contact pressure of wiper arm and wiper blade

for an optimal cleaning of the windshield. The structural units of the three wiper arms formed by the wiper rod 30, the link 20 and the extension spring 50 are covered by a moulded plastics piece 70 of a polyoxide material almost over their entire length, which moulded plastics piece protects the wiper arm against corrosion and against the influence of water and dirt. In the wiper arm according to Figure 7 in addition a hose 80 for the washing liquid supply is surrounded by the moulded plastics piece 70.

As far as the wiper arm according to Figures 1, 8 and 9 is concerned the plastics piece 70 is made by injection-moulding polyoxide into a cavity of a die surrounding a core whose shape corresponds to the shape of the structural unit, if the U-shaped cross-section of the link 20 is conceived as a closed ring. Thereby the injection-moulded plastics piece 70 is provided with a receiver 100, which can closely surround the structural unit. Figures 8 and 9 show cross-sections through the completed injection-moulded plastics piece 70, which cross-sections correspond to cross-sections taken on the lines VIII-VIII and IX-IX of Figure 1. As these Figures show the moulded piece 70 is jointless and is suitably pushed on the structural unit from the wiper rod. As Figure 9 shows, the contour of the moulded piece 70 in its area enclosing the wiper rod 30 is substantially triangular, so that the impinging airstream can be well deflected. The thickness of the moulded piece 70 is varied towards the connecting member 40 in the manner of steps, so that the result is a dense passage to the connecting member 40 without edges as Figure 1 shows. As Figure 1 furthermore shows on the underside of the structural unit the moulded piece 70 only reaches as far as to the rear suspension point 51 of the extension spring 50, so that the C-yoke 60 is uncovered and the wiper arm can be tilted from the window pane. Moreover the moulded piece 70 encloses the structural unit consisting of wiper rod 30, link 20, extension spring 50 and C-yoke 60 on its upper side not facing the window pane to be cleaned and on its two longitudinal sides as far as to the rear end 29. The projections 32 protruding from the wiper rod 30 thereby provide a firm hold of the moulded plastics part 70. Thereby the thickness of the moulded piece 70 in its area positioned in the junction point of the wiper rod 30 and the link 20 is reduced continuously, so that the edges of the link 20 are covered without being able to press bumps out of the moulded plastics piece and finally the entire structural unit has an edgeless generated surface. As Figure 4 shows the moulded piece 70 reaches as far as over the rivet 11 on the two longitudinal sides, so that both its set-head and its closing head are covered. Because in addition to the coated structural unit a cap 90 is also articulated on

the link rivet 11, which consists of the same polyoxide as the moulded piece 70 and covers the fastening member from the top, from the sides and from the rear and on its upper side not facing the window is elongated as far as beneath the link 20 (please compare Figure 1), the entire wiper arm is optimally protected against corrosion and has a perfect stylistic appearance.

Figures 10 and 11 show cross-sections of differently constructed moulded plastics pieces 70, which can also advantageously be used in the structural unit according to Figure 1. The cross-sections approximately correspond to those taken on the line VIII-VII of Figure 1. The moulded piece 70 shown in Figure 10 consists of an upper part 72 having a U-shaped-cross section and a lower part 73 having a rectangular cross-section. The two parts 72, 73 are made of the same polyoxide by injection-moulding into a die having several cavities, whose dimensions correspond to the desired size of the parts 72, 73. The separating plane between the parts 72, 73 is placed in such a way in the course of production that the receiver 100 for the wiper arm is completely positioned in the upper part 72. Thereby the upper part 72 has toric swellings 74 along the two longitudinal sides 72a, 72b, on which swellings the lower part 73 with its matchingly formed cavities 75 is locked. Preferably the mounting of the parts 72, 73 on the wiper arm is effected in such a way that at first the upper part 72 is clipped onto the wiper arm from the side not facing the window pane to be cleaned and then the lower part 73 is buttoned on the upper part 72. Then the joints resulting from the production in two pieces do not affect the stylistic impression of the wiper arm.

The moulded piece 70 shown in Figure 11 is substantially constructed like the moulded piece 70 shown in Figure 10. Thus it has an upper part 72 with a U-shaped cross-section and toric bulges 74 along its longitudinal sides 72a and 72b and a lower part 73 with a rectangular cross-section. However in this case the lower part 73 is integrally connected with one longitudinal side 72a of the upper part 72 by a film hinge 76. This has the great advantage that the lower part 73 cannot be lost before it is mounted on the wiper arm. The plastics parts shown in Figures 10 and 11 can in particular be mounted easily and therefore are also suitable for retrofitting by nonprofessionals.

The wiper arm according to Figure 5 is enclosed by a jointless moulded plastics piece 70 which, beginning from the connecting piece 40 covers all longitudinal sides of the wiper rod over their entire length and the central wall and the side walls of the link 20 over their entire length and the side opposite to the central wall as far as to the C-yoke. In contrast to the moulded piece 70 shown in

Figure 1 the moulded piece 70 shown in Figures 5 and 6 from the wiper rod 30 to the C-yoke 60 resembles a spoiler and is very thick. It has a clublike cross-section over its entire length, whereby the area 77 curved towards the wiper rod 30 acts as a wind deflecting face. This embodiment has the great advantage that no further means are necessary to improve the aerodynamic behaviour of the wiper arm.

The wiper arm according to Figure 7 is also surrounded by a jointless moulded plastics piece 70, which from the connecting piece 40 covers the wiper rod 30 on all longitudinal sides over their entire length and the central wall and the side walls of the link 20 over their entire length and the side opposite to the central wall as far as to the C-yoke.

However in this case the moulded plastics piece 70 is provided with a bore 78 running in the longitudinal direction of the wiper rod, which bore serves as a duct for the washing liquid. The bore 78 is recessed from the underside of the moulded piece 70 and extends through the latter from the front end of the link 20 to the connecting piece 40. The connecting piece 40 has a bore 43, which is aligned with the bore 78 and is connected with it by a connection piece 110 of a flexible plastics material, which has a slightly greater outside diameter than the diameter of the bores 78, 43 at the ends facing each other. Therefore the two bores 78, 43 are interconnected in a leakproof manner. The bore 43 ends at a side face of the connecting piece 40 in a bent end 43a into which a nozzle body is buttoned. In the rear end 78a of the bore 78 is inserted the rubber hose 80 which extends through the hollow space enclosed by the link 20 and the moulded piece 70 and leaves the structural unit through an opening recessed in the area of the C-yoke and conducts to a washing liquid container not shown in the drawing. This embodiment has the advantage that an optimal washing liquid supply to the wiper blade is possible.

The link 20 of the wiper arms shown in Figures 12 to 15 is articulated behind the wiper shaft 12 via a link rivet 11. The moulded plastics piece 70 is elongated rearwards and also covers the fastening member 10. Thereby the moulded plastics piece 70 shown in Figure 12 consists of a polyurethane foam and is made by foam-moulding around the entire wiper rod 30 with the exception of its hook enabling the connection with the wiper blade and foam-moulding around the link 20 and the fastening member 10 from the top and from the side, while the moulded plastics piece 70 of Figures 13 to 15 is composed of two parts 72 and 73 which are separately injection-moulded and thereafter put around the wiper arm like a coat and locked with each other. Thereby bolt-shaped studs 72c are injection-moulded on the part

72 forming the upper Part which studs are conducted through apertures 36 in the wiper rod 30 and ensure a rivet-like connection of upper part 72 and wiper rod 30 after having been hot-formed and pressed in direction to the wiper rod 30. Thereby it is taken care that the upper part 72, which in the area of the wiper rod 30 is injection-moulded with about the same thickness as the walls of the link, is held at a spacing to the wiper rod 30 by a flange-like area 72d of the studs 72c, in order to prevent that the link 20 with its front edges presses bucklings into the moulded plastics piece 70, so that the optical impression would be affected.

The links 20 of the two wiper arms and the two moulded plastics pieces 70 thereby have apertures 20a and 70a, through which the nut 12a, if required, is accessible without tilting the wiper arm, which nut holds the fastening member 10 on the wiper shaft 12. A cap 20 is clipped in the apertures 20a and 70a, which cap ends in a plane with the side of the moulded plastics piece 70 not facing the window pane, so that also in this case the uniform impression of the wiper arm surface is ensured.

Thereby the contact pressure of the wiper arms is provided by means of compression springs 130 which are formed as cylindric helical springs and surround a pin 131, which is rotatably articulated round a pin 132 on the front end 13 of the fastening member 10. As Figures 12 and 13 show by this kind of articulating the compression spring on the front end 13 of the fastening member and the link behind the wiper shaft 12 and below the wiper arm fastening place 12a a particularly narrow and flat wiper arm is created.

On its end articulated on the pin 132 the pin 131 has stop shoulders 131a for the first end 130 of the compression spring 130. With its other end the pin 131 extends through a hole in a stud of the wiper rod 30, which stud is rectangularly bent downwards and against which in the embodiments shown in Figure 12 the compression spring 130 with its second end 130b directly abuts. In the embodiment shown in Figure 13 the compression spring 130 abuts against the stud of the wiper rod 30 via an intermediate member 133 of a plastics material with good gliding properties. The intermediate member 133 encompasses the second end 130b of the compression spring 130 and on its side facing the wiper rod stud is crowned. Thus, when curved areas of the window pane are wiped and the wiper arm is tilted from the window pane, the compression spring can carry out a compensating movement relative to the wiper rod 30 rapidly and without squeaking or bending.

In the example shown in Figures 13 to 15 the compression spring 130, from below until close to its first end 130a, is covered by the lower part 73 of the moulded plastics piece

70 having a curved end at a spacing from the compression spring 130. In its area in perpendicular direction flush with the compression spring 130 the lower part 73 is longitudinally slotted and open as Figure 15 shows. In the example shown in Figure 12 the compression spring 130 is covered from below by a separately made cover 140 which joints the lower ends of the moulded plastics piece 70 without edges. The cover 140 has a recess 141, which, shortly behind the perpendicular wall 142 of the cover 140, begins with a width corresponding to the fastening member 10, extends in this width to the front as far as to the first end 130a of the compression spring 130 and then continues in a width corresponding to the diameter of the compression spring 130 and ends in front of the second end of the pin 131. Owing to the recess 141 according to Figure 12 or the longitudinal slot of the lower part 73 according to Figure 15 the links 20 can be tilted from the window pane or from the fastening member 10 without damaging or demounting the moulded plastics piece 70 and the cover 140 by the spring 130 and the fastening member 10.

In the two examples the moulded plastics piece 70 is thereby elongated beyond the junction place 150 of wiper arm and wiper blade to the front and is designed much thicker than in the other areas, in order to form a spoiler which can cover the wiper blade over the entire length and a height as great as possible. Thereby in the example shown in Figure 12, in which the moulded plastics piece 70 consists of a polyurethane foam, the wiper rod 30 runs as far as to the free front end of the spoiler, so that its stability against bending or buckling is ensured. In this case the wiper blade is fastened on a hook 151, which is riveted with the wiper rod 30 via a sheet metal portion 152 before the foam-moulding action. The wiper arm shown in Figure 13 has a wiper rod of usual length. This wiper rod is laterally bent at right angle to form a hook 151 on which the wiper blade is fastened. Here the upper part 72 of the moulded plastics piece 70 is elongated beyond the hook 151 and forms the spoiler.

Finally it is pointed out that also several of the details shown in the various examples can be simultaneously included in a single wiper arm. Which details this could be will depend on the actual requirements.

CLAIMS

1. A wiper arm, especially for wiper systems on motor vehicles, comprising a link (20) which is substantially formed in the manner of a channel having two side walls (22) and at least one connecting wall (21) which firmly encompass a wiper rod (30) on whose end not facing the link (20) a wiper blade may be articulated via a connector (40) and

- which link (20) and which wiper rod (30) are made from metallic materials and provided with a protective coating, characterised in that the coating consists of a moulded plastics piece (70) which on all sides and over almost its entire length encloses the structural unit consisting of the wiper rod (30) and the link (20) and elements (10, 11, 50, 60, 80, 130, 131, 132, 133) accommodated in this link.
- 10 2. A wiper arm according to claim 1, characterised in that the moulded plastics piece (70) has a thickness which equals at least to the thickness of the walls (21, 22) of the link (20) and which changes over the length of the structural unit.
- 15 3. A wiper arm according to claim 1 or claim 2, characterised in that the moulded plastics piece (70) is made of a resilient plastics material by injection moulding, casting, foam or dip moulding.
- 20 4. A wiper arm according to claim 3, characterised in that the moulded plastics piece (70) has a receiver (100) which closely surrounds the structural unit.
- 25 5. A wiper arm according to claim 3, characterised in that the moulded plastics piece (70) encloses the structural unit at a given spacing over part of its length and is preferably lockably connected with the structural unit via studs (72c).
- 30 6. A wiper arm according to any one of claims 2 to 5, characterised in that the moulded plastics piece (70) is made of a polyoxide, preferably of a copolymer of polymethylene oxide, by injection-moulding around the structural unit or by injection-moulding around a core which resembles the structural unit.
- 35 7. A wiper arm according to any one of claims 2 to 5, characterised in that the moulded plastics piece (70) is made of a pasty solution of a vinylchloride or vinylacetate-polymerisate by casting around the structural unit or casting around a cast core which resembles the structural unit.
- 40 8. A wiper arm according to any one of claims 2 to 7, characterised in that the moulded plastics piece (70) is formed without joints.
- 45 9. A wiper arm according to any one of claims 2 to 7, characterised in that the moulded plastics piece (70) consists partially or entirely of two parts (72, 73), which are detachably connected with each other along at least one longitudinal side (72a, 72b).
- 50 10. A wiper arm according to claim 9, characterised in that along one longitudinal side (72a) the parts (72, 73) are connected to form a single piece by a film hinge (76).
- 55 11. A wiper arm according to claim 9 or 10, characterised in that the two parts (72, 73) are connected by matching elements (74, 75) of locking connections.
- 60 12. A wiper arm according to any one of claims 9 to 11 as appendant to claim 4, characterised in the separating plane(s) is(are) provided in such a way that the receiver (100) lies in the part (72) not facing the window pane to be cleaned.
- 65 13. A wiper arm according to any one of the preceding claims, characterised in that the moulded plastics piece (70) is formed as a spoiler over a certain part of its longitudinal extension.
- 70 14. A wiper arm according to claim 13, characterised in that the moulded plastics piece (70) has an approximately triangular cross-section, wherein at least one side face acts as a wind deflecting face.
- 75 15. A wiper arm according to any one of the preceding claims, characterised in that the link (20) is provided with apertures (23).
- 80 16. A wiper arm according to claim 15, characterised in that both the central wall (21) and the side walls (22) of the link (20) are penetrated by apertures (23) in such a way that the link (20) consists mainly of ribs which are arranged relative to one another in the manner of a network.
- 85 17. A wiper arm according to claim 16, characterised in that the link (20) with its side walls (22) is articulated to a fastening member (10) via link rivet (11), which fastening member is connected with a driven wiper shaft (12) in a torsionally firm manner.
- 90 18. A wiper arm according to claim 17, characterised in that the moulded plastics piece (70) covers both the set-head and the closing head of the link rivet (11).
- 95 19. A wiper arm according to claim 18, characterised in that the fastening member (10) is covered by a plastics cap (9) which in the longitudinal direction of the wiper arm extends as far as to the link rivet (11).
- 100 20. A wiper arm according to claim 19, characterised in that the moulded plastics piece (70) overlaps the cap (9) in its area positioned in front of the link rivet (11) in the longitudinal direction of the wiper arm.
- 105 21. A wiper arm according to any one of the preceding claims, characterised in that the wiper rod (30) is provided with locking means (31, 32, 33, 34, 35, 36) for securing in a form-fit manner at least one of the piece parts (20, 40, 70) to be connected with the said wiper rod.
- 110 22. A wiper arm according to claim 21, characterised in that in the vicinity of the junction point with the link (20) several notches (31) are stamped in the wiper rod (30) and that by embossing the notches (31) hump-shaped projections (32) are formed which protrude from the surface of the wiper rod (30).
- 115 23. A wiper arm according to claim 16 or claim 22, characterised in that the link (20) consists of a slightly softer steel sheet than the wiper rod (30) and is dug in the notches (31).
- 120 24. A wiper arm according to any one of

claims 21 to 23, characterised in that in the vicinity of the junction point with the connecting member (40) at least one set of gear teeth (33) is stamped in the wiper rod (30) and that by embossing the gear teeth (33) sharp-edged projections (35) are formed, which protrude from the surface of the wiper rod (30).

25. A wiper arm according to claim 24, characterised in that the connecting member (40) is made of a resilient plastics material and that the sharp-edged projections (35) are dug in the plastics material.

26. A wiper arm according to any one of the preceding claims, characterised in that the connecting member (40) and the moulded plastics piece (70) change into each other at least almost without edges and joints.

27. A wiper arm according to claim 26 and according to any one of claims 15 to 25, characterised in that the moulded plastics piece (70) and the connecting member (40) have two bores (78, 43) which are aligned with each other and substantially run in the longitudinal direction of the wiper rod and serve as a washing liquid duct.

28. A wiper arm according to claim 26 or 27, characterised in that the connecting member (40) and the moulded plastics piece (70) are made as a single piece.

29. A wiper arm according to claim 27 or claim 28 as appendant to claim 27, characterised in that the bores (78, 43) are interconnected by a connection piece of a resilient material in a leakproof manner.

30. A wiper arm according to claim 27, claim 28 as appendant to claim 27 or claim 29, characterised in that a flexible hose (80) is conducted through the link (20) and inserted in the free end (78a) of the bore (78) situated in the moulded plastics piece (70).

31. A wiper arm according to claim 27, claim 28 as appendant to claim 27, claim 29 or claim 30, characterised in that a nozzle body may be buttoned into the free end (43a) of the other bore (43).

32. A wiper arm according to claim 17 or claim 18, characterised in that the moulded plastics piece (70) is elongated rearwards and covers the fastening member (10).

33. A wiper arm according to claim 32, characterised in that the moulded plastics piece (70) has an aperture (70a) which may be closed by a lockable cap (120), through which a fastening means (12a) is accessible through an aperture (20a) in the link (20) by which fastening means the fastening member (10) on the wiper shaft (12) is held.

34. A wiper arm according to any one of the preceding claims, characterised in that the moulded plastics piece (70) extends beyond the junction point (150) between wiper arm and wiper blade and covers the wiper blade over at least almost its entire length in the manner of a spoiler.

35. A wiper arm according to claim 34,

characterised in that the wiper rod (30) extends beyond the junction point (15) with the wiper blade and reaches at least almost as far as to the front end of the moulded plastics piece (70).

36. A wiper arm according to any one of the preceding claims, characterised in that the open side of the link (20) is covered by the moulded plastics piece (70) or by a cover (140) which is joined to the ends of the moulded plastics piece (70) without edges and possibly has a recess (141) which permits the link (20) to be tilted from the window pane without demounting or damaging the moulded plastics piece or the cover (140) by the spring (50, 130).

37. A wiper arm for wiper systems on motor vehicles substantially as herein described with reference to and as illustrated in Figures 1 to 4, Figures 5 and 6, Figure 7, Figure 12 or Figures 13 to 15, with or without reference to any one of Figures 8 to 11 of the accompanying drawings.

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